Remarks

Claims 8, 9, 11-14, 16-23, 26 and 27 are pending.

Claim 8 was amended to particularly point out and distinctly claim Applicants' invention. Claim 8 recites that an analog-to-digital converter is provided for each of the resistive shunts, the analog-to-digital converter for sensing a voltage developed across a corresponding one of the resistive shunts and generating digital signals indicative of the current flowing through the corresponding one of the resistive shunts, the analog-to-digital converter being included in an integrated circuit mounted on and electrically connected to the corresponding one of the resistive shunts. See, for example, Claim 9 and former Claims 10 and 15; Figures 3-5; and the corresponding disclosure.

Claims 9, 11-14 and 17-21 were amended to be consistent with the amendment to Claim 8.

Claims 10 and 15 were canceled, without prejudice.

Claim 22 was amended to particularly point out and distinctly claim Applicants' invention. Claim 22 recites employing a plurality of resistive shunts; placing each of the resistive shunts in series with a corresponding one of the phase lines and the neutral line; measuring the current flowing through each of the resistive shunts, the measuring comprising for each of the resistive shunts: providing an analog-to-digital converter for a corresponding one of the resistive shunts, employing the analog-to-digital converter for sensing a voltage developed across the corresponding one of the resistive shunts and generating digital signals indicative of the current flowing through the corresponding one of the resistive shunts, and including the analog-to-digital converter in an integrated circuit mounted on and electrically connected to the corresponding one of the resistive shunts. See, for example, Claim 23, former Claims 24-25; Figures 3-5; and the corresponding disclosure.

Claims 23, 26 and 27 were amended to be consistent with the amendment to Claim 22.

Claims 24-25 were canceled, without prejudice.

An Associate Power of Attorney accompanies this Amendment.

Rejections under 35 U.S.C. § 103(a)

The Examiner rejects Claims 8, 19 and 22 as being unpatentable over U.S. Patent No. 5,930,093 (Morrissett) in view of U.S. Patent No. 5,475,557 (Larom et al.).

Claims 9-14, 17, 18, 20, 21, 23, 24 and 27 are rejected as being unpatentable over Morrissett in view of Larom et al. as applied to Claims 8, 19 and 22, and further in view of U.S. Patent No. 6,058,354 (Adame et al.).

Claims 15, 25 and 26 are rejected as being unpatentable over Morrissett in view of Larom et al. and in view of Adame et al. as applied to Claims 9-14, 17, 18, 20, 21, 23, 24 and 27, and further in view of U.S. Patent No. 5,181,026 (Granville).

Morrissett discloses a safety circuit 38 comprising two resistors 42 in series with fault sensing relay (FSR) contacts 40. A current imbalance detector 45 comprises current sensors 46 that sense current flow in the safety circuit itself. Morrissett does not disclose any integrated circuit and does not disclose any analog-to-digital converter.

Larom et al. discloses a current detector/interrupter (CDI) and a local safety system (LSS) including a local ground fault detector LGFD capable of detecting three different levels of current imbalance. Larom et al. does not disclose any integrated circuit and does not disclose any analog-to-digital converter.

Adame et al. discloses a 3-phase electricity meter including a first processor 1 that is connected via a bus connection to a downstream second processor 2. The three network phase voltages are each measured by means of a voltage sensor 5, the output of which is connected via one of three analog/digital converters 3 to a separate input of processor 1. Three network phase currents are each measured by means of a current sensor 6, whose output is connected via one of three analog/digital converters 4 to another separate input of the processor 1.

Granville discloses a monitoring system (Figure 1) having voltage, current, electric field phasor, phase angle and temperature sensing devices mounted in a measuring station housing pod 10. The pod 10 includes a voltage sensing circuit 30 having a small precision resistance R_S connected at 45 to circuitry system return 32 in contact with transmission line 12 at 47. The circuit 30 (Figure 1A) includes an A/D converter integrated circuit device having a fast digital waveform data paths D1D. Signal processor and data transmission circuits 33 (Figure 1B) also provide A/D conversion. Granville discloses that while the use of digital D1D data avoids any analog linearity or noise issues, there is the requirement for the A/D conversion circuitry to be located within the line measuring station housing pod 10 (Figure 1) up on the power line, and for the delay inherent in the A/D conversion time. All the system circuitry within the housing pod 10 is housed within a smoothly contoured spherical or semi-spherical or box-shaped housing or pod 52 (Figure 3) mounted or clamped on transmission line 12 with a device known as a "hot-stick" used by power companies. Within the pod 10, all circuit boards may be enclosed within a shielded box in the shape of a cube having a 5 inch side.

Claim 8 was amended to include, *inter alia*, the limitations of former Claim 15. Claim 22 was amended to include, *inter alia*, the limitations of former Claim 25. Accordingly, this response considers Claims 8, 9, 11-14, 17-23, 26 and 27 as having been rejected as being unpatentable over Morrissett in view of Larom et al. and in view of Adame et al., and further in view of Granville.

Claim 8 recites, *inter alia*, a residual current detection device for continuously monitoring to detect imbalances between currents flowing to a load in one or more phase lines and from the load in a neutral line, comprising: a plurality of resistive shunts, each connected in series with one of the phase lines and the neutral line; and circuitry for continuously monitoring to detect an imbalance between the currents flowing through the resistive shunts, the circuitry comprising: an analog-to-digital converter provided for each of the resistive shunts, the analog-to-digital converter for sensing a voltage developed across a corresponding one of the resistive shunts and generating digital signals indicative of the current flowing through the corresponding one of the resistive shunts, the analog-to-digital converter being included in an integrated circuit mounted on and electrically connected to the corresponding one of the resistive shunts.

None of the references of record, whether taken alone or in combination, teaches or suggests any analog-to-digital converter being included in an integrated circuit ***mounted on and*** electrically connected to a resistive shunt.

The Examiner states, regarding former Claims 15 and 25, Granville and Morrissett that "the A/D converter has to be mounted on the shunt in order to measure the current through the shunt." This statement is respectfully traversed as applied to the refined recital of Claim 8, as amended.

It is respectfully submitted that this conclusion can only be reached by way of hindsight, which is improper. First, the Examiner admits that Morrissett and Adame et al. do not disclose that an analog-to-digital converter is an integrated circuit. Actually, as was discussed above, Morrissett and Larom et al. do not disclose any integrated circuit and do not disclose any analog-to-digital converter. Clearly, these references do not teach or suggest any integrated circuit ***mounted on and*** electrically connected to a resistive shunt. At best, Adame et al. (Figure 1) discloses analog/digital converters 3,4 that are electrically connected to voltage sensors 5 or current sensors 6. There is no teaching or suggestion in Adame et al. as to how such converters 3,4 might be mounted within the context of Claim 8. Accordingly, Adame et al. adds nothing to Morrissett and Larom et al. regarding any analog-to-digital

converter being included in an integrated circuit ***mounted on <u>and</u>*** electrically connected to a resistive shunt.

<u>Granville</u> discloses a circuit 30 (Figure 1A) including an A/D converter integrated circuit device. <u>Granville</u> expressly teaches that such circuit 30 is housed within a housing pod 10 that, in turn, is housed within a smoothly contoured spherical or semi-spherical or box-shaped housing or pod 52 (Figure 3 of <u>Granville</u>) that, in turn, is mounted or clamped on a transmission line 12 with a device known as a "hot-stick" used by power companies. Within the pod 10, all circuit boards may be enclosed within a shielded box in the shape of a cube having a 5 inch side. <u>Granville</u>, which mounts or clamps a pod 52 on a transmission line 12, adds nothing to <u>Adame et al.</u>, <u>Morrissett</u> and <u>Larom et al.</u> regarding any analog-to-digital converter being included in an integrated circuit ***mounted on <u>and</u>*** electrically connected to a resistive shunt.

Therefore, for the above reasons, it is submitted that Claim 8 patentably distinguishes over the references.

Claims 9, 11-14 and 17-21 depend either directly or indirectly from Claim 8 and patentably distinguish over the references for the same reasons.

Claims 9, 12, 13 and 18-21 are not separately asserted to be patentable except in combination with Claim 8 from which they depend.

Claim 11 is not separately asserted to be patentable except in combination with Claims 8 and 9 from which it depends.

Claim 14 is not separately asserted to be patentable except in combination with Claims 8 and 9 from which it depends.

Claim 17 is not separately asserted to be patentable except in combination with Claims 8 and 12 from which it depends.

Claim 16 is rejected as being unpatentable over <u>Morrissett</u> in view of <u>Larom et al.</u> and in view of <u>Adame et al.</u> as applied to Claims 9-14, 17, 18, 20, 21, 23, 24 and 27, and further in view of U.S. Patent No. 4,866,559 (<u>Cobb, III et al.</u>).

<u>Cobb, III et al.</u> discloses a first temperature sensor or transducer 5 is disposed on a resistive element 3 at the central region thereof to measure the element temperature and a second sensor or transducer 7 is disposed adjacent the element 3 and in close proximity thereto to measure the ambient temperature. The resistive element 3 is shown mounted on heat sink studs 9 and 11 at which locations the resistive element 3 is coupled to the line and the load. In this manner, the temperature differential between ambient and the resistive element 3 can be determined. The temperature differential is determined by providing a

signal indicative of measured temperature from each sensor along lines 13 and 15 to a comparator (not shown) which provides an output voltage indicative thereof. Cobb, III et al. does not disclose any integrated circuit and does not disclose any analog-to-digital converter.

Cobb, III et al. does not disclose any integrated circuit and does not disclose any analog-to-digital converter. Clearly, this reference adds nothing to the other references regarding any integrated circuit ***mounted on and*** electrically connected to a resistive shunt to render Claim 8 unpatentable.

Claim 16 depends indirectly from Claim 8 and patentably distinguishes over the references for the same reasons.

Claim 16 is not separately asserted to be patentable except in combination with Claims 8 and 12 from which it depends.

Claim 22 is an independent claim which recites, *inter alia*, a method of monitoring to detect current imbalance in a residual current detection device between one or more phase lines and a neutral line through which currents respectively flow to and from a load, the method comprising the steps of: employing a plurality of resistive shunts; placing each of the resistive shunts in series with a corresponding one of the phase lines and the neutral line; measuring the current flowing through each of the resistive shunts, the measuring comprising for each of the resistive shunts: providing an analog-to-digital converter for a corresponding one of the resistive shunts, employing the analog-to-digital converter for sensing a voltage developed across the corresponding one of the resistive shunts and generating digital signals indicative of the current flowing through the corresponding one of the resistive shunts, and including the analog-to-digital converter in an integrated circuit mounted on and electrically connected to the corresponding one of the resistive shunts; and continuously monitoring the measured currents to detect an imbalance between the currents flowing through the resistive shunts.

None of the references of record, whether taken alone or in combination, teaches or suggests any analog-to-digital converter being included in an integrated circuit ***mounted on and*** electrically connected to a resistive shunt.

The Examiner states, regarding former Claims 15 and 25, Granville and Morrissett that "the A/D converter has to be mounted on the shunt in order to measure the current through the shunt." This statement is respectfully traversed as applied to the refined recital of Claim 22, as amended.

It is respectfully submitted that this conclusion can only be reached by way of hindsight, which is improper. First, the Examiner admits that Morrissett and Adame et al. do

not disclose that an analog-to-digital converter is an integrated circuit. Actually, as was discussed above, Morrissett and Larom et al. do not disclose any integrated circuit and do not disclose any analog-to-digital converter. Clearly, these references do not teach or suggest any integrated circuit ***mounted on and*** electrically connected to a resistive shunt. At best, Adame et al. (Figure 1) discloses analog/digital converters 3,4 that are electrically connected to voltage sensors 5 or current sensors 6. There is no teaching or suggestion in Adame et al. as to how such converters 3,4 might be mounted within the context of Claim 22. Accordingly, Adame et al. adds nothing to Morrissett and Larom et al. regarding any analog-to-digital converter being included in an integrated circuit ***mounted on and*** electrically connected to a resistive shunt.

Granville discloses a circuit 30 (Figure 1A) including an A/D converter integrated circuit device. Granville expressly teaches that such circuit 30 is housed within a housing pod 10 that, in turn, is housed within a smoothly contoured spherical or semi-spherical or box-shaped housing or pod 52 (Figure 3 of Granville) that, in turn, is mounted or clamped on a transmission line 12 with a device known as a "hot-stick" used by power companies. Within the pod 10, all circuit boards may be enclosed within a shielded box in the shape of a cube having a 5 inch side. Granville, which mounts or clamps a pod 52 on a transmission line 12, adds nothing to Adame et al., Morrissett and Larom et al. regarding any analog-to-digital converter being included in an integrated circuit ***mounted on and*** electrically connected to a resistive shunt.

Therefore, for the above reasons, it is submitted that Claim 22 patentably distinguishes over the references.

Cobb, III et al. does not disclose any integrated circuit and does not disclose any analog-to-digital converter. Clearly, this reference adds nothing to the other references regarding any integrated circuit ***mounted on and*** electrically connected to a resistive shunt to render Claim 22 unpatentable.

Claims 23, 26 and 27 depend either directly or indirectly from Claim 22 and patentably distinguish over the references for the same reasons.

Claims 23 and 26 are not separately asserted to be patentable except in combination with Claim 22 from which they depend.

Claim 27 is not separately asserted to be patentable except in combination with Claims 22 and 23 from which it depends.

Reconsideration and early allowance are requested.

Respectfully submitted,

Kirk D. Houser
Registration No. 37,357
Attorney for Applicants

(412) 566-6083